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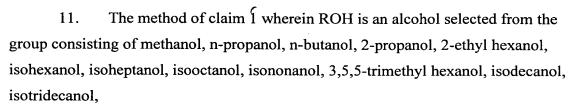


## What is claimed is:

- 1. A method of making an ester comprising:
- (a) contacting an olefin or ether with carbon monoxide and an acid composition comprising BF<sub>3</sub>·2ROH to form a product composition;
  - (b) adding ROH to the product composition of (a); and
  - (c) separating an acid product comprising BF<sub>3</sub>·2ROH from the ester.
  - 2. The method of claim 1 further comprising:
- 10 (d) recycling a portion of the separated acid product to contact the olefin or ether.
  - 3. The method of claim 1 wherein the olefin is selected from the group consisting of ethylene, propylene, isoolefins, normal butenes, and  $C_5$  to  $C_{18}$  olefins.
    - 4. The method of claim 2 wherein the olefin is isobutene.
  - 5. The method of claim 1 wherein the ether is represented by the general formula R'-O-R", wherein R' = saturated  $C_1$   $C_{13}$  alkyl and R" = saturated  $C_1$   $C_{13}$  alkyl, and R' and R" can be the same or different.
    - 6. The method of claim 5 wherein the ether is methyl-t-butylether.
- 7. The method of claim 1 wherein contacting the olefin or ether comprises contacting at a temperature from about 60°C to about 200°C.
  - 8. The method of claim 7 wherein contacting the olefin or ether comprises contacting at a temperature from about 110°C to about 160°C.
- 30 9. The method of claim 1 wherein contacting the olefin or ether comprises contacting at a pressure from about 30 atm to about 200 atm.
  - 10. The method of claim 9 wherein contacting the olefin or ether comprises contacting at a pressure from about 110 atm to about 160 atm.

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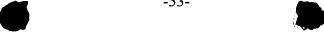
1-octanol, 1-decanol, 1-dodecanol, and 1-tetradecanol.

- 12. The method of claim 1 wherein ROH is methanol.
- 10 13. The method of claim 1' wherein the ether is methyl-t-butyl ether.
  - 14. The method of claim 1' wherein the ether is diisopropyl ether and ROH is 2-propanol.
- 15. The method of claim 1 further comprising:
  - (d) contacting the olefin or ether with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.
- 20 16. The method of claim 1 further comprising:
  - (d) adding a hydrocarbon to the product composition of (a), wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.
  - 17. The method of claim 16 further comprising:
    - (e) separating the hydrocarbon and ROH from BF<sub>3</sub>·2ROH and directing a portion of the separated hydrocarbon and the separated ROH to a unit selected from the group consisting of a separation unit, a reaction unit, and a combination thereof.
- The method of claim 1 further comprising:
  - (d) contacting the olefin or ether with phosphoric acid.

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- 19. The method of claim 1 wherein separating the acid product comprises concentrating the acid product such that the molar ratio ROH:BF3 in the concentrated acid product is from about 2:1 to about 4:1.
- 20. The method of claim 19 wherein the concentrated acid product 5 comprises a molar ratio of ROH:BF<sub>3</sub> from about 2:1 to about 3:1.
  - The method of claim 1 wherein the acid composition comprises a 21. molar ratio of ROH:BF<sub>3</sub> from about 1.6:1 to about 3: 1.
  - The method of claim 21 wherein the acid composition comprises a 22. molar ratio of ROH:BF3 from about 1.9:1 to about 3:1.
- The method of claim 1 where the product composition contains less 23. than 3% by weight carboxylic acid. 15
  - 24. A method of making methyl pivalate comprising: contacting methyl-t-butylether with carbon monoxide and an acid composition comprising BF<sub>3</sub>·2CH<sub>3</sub>OH to form a product composition comprising methyl pivalate; adding methanol to the product composition; and separating an acid product comprising BF<sub>3</sub>·2CH<sub>3</sub>OH from the methyl pivalate.
  - 25. The method of claim 24 wherein contacting methyl-t-butylether comprises contacting at a temperature of about 110°C to about 160°C.
  - 26. The method of claim 24 wherein contacting methyl-t-butylether comprises contacting at a pressure from about 30 atm to about 200 atm.
- 27. The method of claim 24 further comprising contacting the 30 methyl-t-butylether with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.





28. The method of claim 24 further comprising contacting the product composition with a hydrocarbon, wherein the hydrocarbon is selected from a saturated linear or branched hydrocarbon having at least six carbons.

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29. The method of claim 28 further comprising separating the hydrocarbon and the methanol from the methyl pivalate and directing a portion of the separated hydrocarbon and the separated methanol to a unit selected from the group consisting of a separation unit, a reaction unit, and a combination thereof.

30. The method of claim 24 further comprising contacting the methyl-t-butylether with phosphoric acid.

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31. The method of claim 24 wherein separating the acid product comprises concentrating the acid product such that the molar ratio ROH:BF<sub>3</sub> in the acid product is from about 2:1 to about 4:1.

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32. The method of claim 31 wherein the concentrated acid product comprises a molar ratio of ROH:BF<sub>3</sub> from about 2:1 to about 3:1.

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33. The method of claim 24 wherein the acid composition comprises a molar ratio of ROH:BF<sub>3</sub> from about 1.6:1 to about 3: 1.

34. The method of claim 33 wherein the acid composition comprises a molar ratio of ROH:BF<sub>3</sub> from about 1.9:1 to about 3: 1.

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35. The method of claim 24 wherein the product composition contains nonanoic methyl esters such that the molar ratio of methyl pivalate to nonanoic methyl esters is about 4 or greater.

